

## MULTI-PHYSICS MULTI-SCALE NUMERICAL SIMULATION AND MACHINE LEARNING BASED MODELLING FOR ADDITIVE MANUFACTURING

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### MINISYMPOSIUM

Additive manufacturing (AM), also known as 3D printing, is a revolutionary manufacturing process that fabricates continuum objects layer by layer using digital models or computer-aided design (CAD) data. Several different AM technologies are available, each with its advantages and limitations, making them suitable for different applications and industries. However, the wide industrial adoptions are hindered by the lack of comprehensive understanding of the relationship between the complex manufacturing process, material microstructure formation, mechanical properties, and performance. Using trial-and-error experiments is time-consuming and costly to obtain the process parameters for geometry and properties as expected. Therefore, this mini-symposium (MS) is aimed at providing a platform for mechanicians, computer scientists, and industrial researchers to discuss and share numerical simulation methods and machine learning based computational models for AM process, microstructure, property, and performance to advance the fundamental understanding and to guide further the process parameters optimization as well as the scientific exchanges among scientists, practitioners, and engineers in affiliated disciplines.

The topics of interest are, but not limited to:

- 1 Multi-physics multi-scale numerical simulation methods for AM
- 1 Reduced order methods for AM
- 1 Data-driven based computation for AM
- 1 Digital twin for AM
- 1 High fidelity numerical modelling for AM process
- 1 Grain structure evolution modelling for AM
- 1 Mechanical properties predictions for AM
- 1 Thermoelectric magnetohydrodynamics and electrohydrodynamics in field-assisted AM
- 1 Melt pool dynamics in AM
- 1 Multi-phase flow and interface evolution in AM
- 1 Topological optimization for AM
- 1 Numerical modelling for fracture and fatigue in AM
- 1 Artificial-Intelligence for Science in AM modelling and simulation